WHAT IS CLAIMED IS:

1. An apparatus for driving a control input of one or more power switching devices, comprising:

a drive transformer having a secondary winding;

a plurality of switches each having a control terminal referenced to a common signal reference for turning the switch ON and OFF and an output connected to drive the transformer;

the plurality of switches including a first switch and a second switch being respectively poled to induce a magnetic flux in the drive transformer in a first and in a second direction when ON;

the secondary winding being connected to drive the control inputs of the one or more power switching devices;

a control circuit connected to the control terminals and configured to operate the first and second switches in a series of control cycles each characterized by:

(a) two ON intervals during which one of the first and second switches is ON;

(b) two OFF intervals during which both of the first and second switches is OFF and energy stored in the drive transformer is used to charge and discharge parasitic output capacitances of the plurality of switches and a parasitic input capacitance of the one or more power switching devices.

2. The apparatus of claim 1 wherein:

the one or more power switching devices comprise a pair of complementary switching devices; and

wherein the pair of complementary switching devices are OFF during a portion of the OFF interval.

3. The apparatus of claim 2 wherein the pair of complementary switching devices are connected to drive a power transformer and a magnetizing inductance of the power transformer comprises a value which is small enough to allow ZVS of the complementary switching devices during the time period during which the complementary switching devices are OFF.

4. The apparatus of claim 1 wherein a magnetizing inductance of the drive transformer comprises a value that allows ZVS of the first and second switches during the OFF intervals.

5. The apparatus of claim 1 wherein the plurality of switches comprises exactly two switches and the control terminals of the switches are referenced to ground.

6. The apparatus of claim 1 wherein:

the transformer comprises a primary winding driven by the first and second switches;

the first switch is connected as a primary switch; and

the second switch is connected to the primary winding and a capacitor as a reset circuit.

7. The apparatus of claim 1 wherein:

the transformer comprises a first and a second primary winding driven respectively by the first and second switches; and

the control terminals of the first and second switches are referenced to ground.

8. The apparatus of claim 7 further comprising

an inductive clamp circuit connected across each of said primary windings, each clamp circuit comprising a clamp switch and a clamp diode, each clamp switch being turned ON during a portion of one of said OFF intervals, each clamp circuit being poled to carry the magnetizing current flowing in its respective winding when its respective clamp switch is ON.

9. A method for driving a control input of one or more power switching devices, comprising:

using a secondary winding of a drive transformer to drive the control inputs of the one or more power switching devices;

using a plurality of switches to drive the drive transformer;

connecting a control terminal of each switch to reference a common signal reference for turning the switch ON and OFF,

using a first switch and a second switch in the plurality of switches to respectively induce a magnetic flux in the drive transformer in a first and in a second direction when ON;

operating the first and second switches in a series of control cycles each characterized by:

(a) two ON intervals during which one of the first and second switches is ON;

(b) two OFF intervals during which both of the first and second switches is OFF and energy stored in the drive transformer is used to charge and discharge parasitic output capacitances of the plurality of switches and a parasitic input capacitance of the one or more power switching devices.

10. The method of claim 9 further comprising:

using a pair of complementary switching devices for the one or more power switching devices; and

providing a sub-interval during a portion of the OFF interval when the pair of complementary switching devices are OFF.

11. The method claim 10 further comprising:

connecting the pair of complementary switching devices to drive a power transformer;

providing a value of magnetizing inductance in the power transformer to allow for ZVS of the complementary switching devices during the sub-interval.

12. The method of claim 9 further comprising:

providing a value of magnetizing inductance in the drive transformer to allow for ZVS of the first and second switches during the OFF intervals.

13. The method of claim 9 wherein the plurality of switches comprises exactly two switches and the control terminals of the switches are referenced to ground.

14. The method of claim 9 further comprising:

using the first switch to drive a primary winding of the drive transformer as a primary switch; and

using the second switch and a capacitor as a reset circuit for the drive transformer.

15. The method of claim 9 further comprising:

using the first and second switches to respectively drive a first and a second primary winding of the drive transformer; and

connecting the control terminals of the first and second switches to reference ground.

16. The method of claim 15 further comprising:

using an inductive clamp circuit across the primary windings to carry magnetizing current during a portion of one of said OFF intervals.

17. Apparatus for delivering a unipolar control voltage comprising:

a transformer having a primary winding, a secondary winding, and a magnetizing inductance;

drive circuitry connected to drive the primary winding to produce a bipolar voltage across the secondary winding;

a first output terminal and a reference terminal for delivering the control voltage;

switch circuitry connected to the secondary winding and adapted to:

(a) connect the secondary winding across the first output terminal and the reference terminal when a voltage across the secondary winding is of a first polarity;

(b) clamp the first output terminal to the reference terminal when a voltage across the secondary winding is of a second polarity; and

(c) enable recycling of energy between the magnetizing inductance of the transformer and the parasitic capacitances of the switch circuitry and the capacitance between the first output terminal and the reference terminal.

18. The apparatus of claim 17 wherein the capacitance between the first output terminal and the reference terminal is a parasitic gate-source capacitance of a MOSFET switch.

19. The apparatus of claim 18 wherein the switch circuitry comprises a MOSFET.

20. The apparatus of claim 17 further comprising:

a first controlled switch having a first control input connected to the first output terminal.

21. The apparatus of claim 17 wherein the switch circuitry further comprises

a first switch connected between a first end of the secondary winding and the reference terminal;

a second switch connected between a second end of the secondary winding and the reference terminal; and

wherein the first output terminal is connected to the second end of the secondary winding.

22. The apparatus of claim 21 further comprising:

a first controlled switch having a first control input connected to the first output terminal; and wherein

the first switch further comprises a control input connected to the second switch;

the second switch further comprises a control input connected to the first switch; and

the first and second switches further comprise a control threshold which is less than a control threshold of the controlled switch.

23. The apparatus of claim 22 further comprising:

a second output terminal connected to the first end of the secondary winding for delivering a second unipolar control voltage relative to the reference; and

a second controlled switch having a second control input connected to the second output terminal;

wherein the switch circuitry is further adapted to:

(d) connect the secondary winding across the second output terminal and the reference terminal when a voltage across the secondary winding is of the second polarity;

(e) clamp the second output terminal to the reference terminal when a voltage across the secondary winding is of the first polarity; and

(f) enable recycling of energy between the magnetizing inductance of the transformer and the capacitance between the second output terminal and the reference terminal.

24. The apparatus of claim 21 wherein the first and second switches comprise MOSFETs.

25. The apparatus of claim 21 wherein the first and second switches comprise junction transistors.

26. The apparatus of claim 22 further comprising:

a first series circuit having a first resistance connected in parallel with a first unidirectional conducting device, the first series circuit being connected between the control input of the first switch and the second switch;

a second series circuit having a second resistance and a second unidirectional conducting device connected in parallel, the second series circuit being connected between the control input of the second switch and the first switch; and

wherein the first and second switches comprise junction transistors.

27. The apparatus of claims 17 wherein the drive circuitry comprises:

a plurality of switches each having a control terminal referenced to a common signal reference for turning the switch ON and OFF and an output connected to drive the transformer;

the plurality of switches including a first switch and a second switch being respectively poled to induce a magnetic flux in the drive transformer in a first and in a second direction when ON;

a control circuit connected to the control terminals and configured to operate the first and second switches in a series of control cycles each characterized by:

(a) two ON intervals during which one of the first and second switches is ON;

(b) two OFF intervals during which both of the first and second switches is OFF and energy stored in the drive transformer is used to charge and discharge parasitic output capacitances of the plurality of switches, parasitic capacitances of the switch circuitry, and a parasitic input capacitance of a power switching device having control inputs connected to the first output terminal and the reference terminal.

28. The apparatus of claim 23 wherein the drive circuitry comprises:

a plurality of switches each having a control terminal referenced to a common signal reference for turning the switch ON and OFF and an output connected to drive the transformer;

the plurality of switches including a first switch and a second switch being respectively poled to induce a magnetic flux in the drive transformer in a first and in a second direction when ON;

a control circuit connected to the control terminals and configured to operate the first and second switches in a series of control cycles each characterized by:

(a) two ON intervals during which one of the first and second switches is ON;

(b) two OFF intervals during which both of the first and second switches is OFF and energy stored in the drive transformer is used to charge and discharge parasitic output capacitances of the plurality of switches, parasitic capacitances of the switch circuitry, and parasitic input capacitances of a pair of complementary power switching devices having control inputs connected between the first or second output terminals and the reference terminal;

wherein the pair of complementary switching devices are OFF during a portion of the OFF interval.

29. The apparatus of claim 17 further comprising:

a first integrated semiconductor device formed on a common die and comprising a plurality of FETs each having a gate, a source, and a drain, and having the same threshold voltage;

the first integrated semiconductor device having a first switch section and a first clamp section, the first switch section comprising one or more of the plurality of FETs connected in parallel, and the first clamp section comprising one or more of the plurality of FETs;

the gates of the one or more of the plurality of FETs in the first switch section and first clamp section being connected to a first gate terminal;

the sources of the one or more of the plurality of FETs in the first switch section and first clamp section being connected to a first source terminal; and

the switch circuitry comprising the first clamp section.

30. The apparatus of claim 29 wherein:

the first clamp section comprises a drain terminal connected to a first end of the secondary winding;

the first source terminal is connected to the reference terminal;

the first gate terminal is connected to a second end of the secondary winding; and

further comprising:

a second switch connected between the second end of the secondary winding and the reference terminal; the second switch having a control input connected to the first end of the secondary winding;

wherein the first clamp section clamps the first end of the secondary winding to the reference terminal and holds OFF the second switch when the first switch section is ON.

31. The apparatus of claim 29 further comprising:

a second integrated semiconductor device formed on a common die and comprising a plurality of FETs each having a gate, a source, and a drain, and having the same threshold voltage;

the second integrated semiconductor device having a second switch section and a second clamp section, the second switch section comprising one or more of the plurality of FETs connected in parallel, and the second clamp section comprising one or more of the plurality of FETs;

the gates of the one or more of the plurality of FETs in the second switch section and second clamp section being connected to a second gate terminal;

the sources of the one or more of the plurality of FETs in the second switch section and second clamp section being connected to a second source terminal;

the switch circuitry further comprising the second clamp section;

wherein the second gate terminal is adapted to be clamped by the first clamp and the first gate terminal is adapted to be clamped by the second clamp.

32. The apparatus of claim 31 wherein:

the first clamp section comprises a drain terminal connected to a first end of the secondary winding;

the second clamp section comprises a drain terminal connected to a second end of the secondary winding;

the first source terminal and second source terminal are connected to the reference terminal;

the first gate terminal is connected to the second end of the secondary winding;

the second gate terminal is connected to the first end of the secondary winding;

wherein the first clamp section clamps the first end of the secondary winding to the reference terminal and holds OFF the second switch section and second clamp section when the first switch section is ON and the second clamp section clamps the second end of the secondary winding to the reference terminal and holds OFF the first switch section and first clamp section when the second switch section is ON.

33. The apparatus of claim 32 wherein:

the first and second switch sections drive a power transformer.

34. A method for delivering a unipolar control voltage comprising:

providing a transformer having a primary winding, a secondary winding, and a magnetizing inductance;

providing drive circuitry to drive the primary winding to produce a bipolar voltage across the secondary winding;

providing a first output terminal and a reference terminal for delivering the control voltage;

providing switch circuitry connected to the secondary winding and adapted to:

(a) connect the secondary winding across the first output terminal and the reference terminal when a voltage across the secondary winding is of a first polarity;

(b) clamp the first output terminal to the reference terminal when a voltage across the secondary winding is of a second polarity; and

(c) enable recycling of energy between the magnetizing inductance of the transformer and the parasitic capacitances of the switch circuitry and the capacitance between the first output terminal and the reference terminal.

35. A method for delivering a unipolar control voltage across a first output terminal and a reference terminal in a circuit using switch circuitry and a transformer having a primary, a secondary winding, and a magnetizing inductance, the method comprising:

driving the primary winding to produce a bipolar voltage across the secondary winding;

connecting the secondary winding across the first output terminal and the reference terminal when a voltage across the secondary winding is of a first polarity;

clamping the first output terminal to the reference terminal when a voltage across the secondary winding is of a second polarity; and

recycling energy between the magnetizing inductance of the transformer and parasitic capacitances of the switch circuitry and between the first output terminal and the reference terminal.

36. The method of claim 34 or 35 wherein the capacitive load across the first output terminal and reference terminal comprises a parasitic gate-source capacitance of MOSFET switch.

37. The method of claim 36 further comprising using MOSFETs for the switch circuitry.

38. The method of claim 34 further comprising:

providing a first controlled switch having a first control input connected to the first output terminal.

39. The method of claim 34 further comprising:

using a first switch between a first end of the secondary winding and the reference terminal;

using a second switch between a second end of the secondary winding and the reference terminal; and

connecting the first output terminal to the second end of the secondary winding.

40. The method of claim 39 further comprising:

providing a first controlled switch having a first control input connected to the first output terminal;

connecting a control input of the first switch to the second switch;

connecting a control input of the second switch to the first switch; and

providing the first and second switches with a control threshold which is less than a control threshold of the controlled switch.

41. The method of claim 40 further comprising:

connecting a second output terminal to the first end of the secondary winding for delivering a second unipolar control voltage relative to the reference; and

providing a second controlled switch having a second control input connected to the second output terminal;

further adapting the switch circuitry to:

(d) connect the secondary winding across the second output terminal and the reference terminal when a voltage across the secondary winding is of the second polarity;

(e) clamp the second output terminal to the reference terminal when a voltage across the secondary winding is of the first polarity; and

(f) enable recycling of energy between the magnetizing inductance of the transformer and the capacitance between the second output terminal and the reference terminal.

42. The method of claim 39 further comprising using MOSFETs for the first and second switches.

43. The method of claim 39 further comprising using junction transistors for the first and second switches.

44. The method of claim 40 further comprising:

providing a first series circuit having a first resistance connected in parallel with a first unidirectional conducting device, the first series circuit being connected between the control input of the first switch and the second switch;

providing a second series circuit having a second resistance and a second unidirectional conducting device connected in parallel, the second series circuit being connected between the control input of the second switch and the first switch; and

using junction transistors for the first and second switches.

45. The method of claim 35 wherein the driving comprises:

using a plurality of switches to drive the drive transformer;

connecting a control terminal of each switch to reference a common signal reference for turning the switch ON and OFF,

using a first switch and a second switch in the plurality of switches to respectively induce a magnetic flux in the drive transformer in a first and in a second direction when ON;

operating the first and second switches in a series of control cycles each characterized by:

(a) two ON intervals during which one of the first and second switches is ON;

(b) two OFF intervals during which both of the first and second switches is OFF and energy stored in the drive transformer is used to charge and discharge parasitic output capacitances of the plurality of switches, the switch circuitry, and a parasitic input capacitance of one or more power switching devices having control inputs connected across the first output terminal and the reference terminal.

46. The method of claim 41 wherein:

providing drive circuitry comprises providing a plurality of switches to drive the transformer;

connecting a control terminal of each switch to reference a common signal reference for turning the switch ON and OFF,

using a first switch and a second switch in the plurality of switches to respectively induce a magnetic flux in the transformer in a first and in a second direction when ON;

operating the first and second switches in a series of control cycles each characterized by:

(a) two ON intervals during which one of the first and second switches is ON;

(b) two OFF intervals during which both of the first and second switches is OFF and energy stored in the drive transformer is used to charge and discharge parasitic output capacitances of the plurality of switches, the switch circuitry, and parasitic input capacitances of the first and second controlled switches.

47. The method of claim 46 wherein:

configuring the first and second controlled switches as a pair of complementary power switching devices to drive a power transformer;

providing a sub-interval during a portion of the OFF interval when the pair of complementary power switching devices are OFF.

48. The method of claim 42 further comprising:

integrating the first controlled switch and first switch onto a first die and providing each with the same threshold voltage; and

integrating the second controlled switch and second switch onto a second die and providing each with the same threshold voltage.